NATIONAL UNIVERSITY OF LIFE AND ENVIRONMENTAL SCIENCES OF UKRAINE

Department of Geoinformatics and Aerospace Research of the Earth

APPROVED
Faculty of Land Management

May 15, 2025

CURRICULUM OF ACADEMIC DISCIPLINE

GEOGRAPHIC INFORMATION LAND CADASTRAL SYSTEMS

Area of knowledge	19. Architecture and construction
Specialty	193. Geodesy and Land management
Academic programme	"Geodesy and Land Management"
Faculty	Land Management
Developed by:	Dr. Sci., Associate prof., Koshel A.O.

Kyiv – 2025

Descreption of the course

The discipline studies the basics of creating geoinformation land cadastral systems as a component of spatial data infrastructure. The issues presented are related to the management of the spatial component of land cadastral information systems. The elements of the automated National Cadastral System (NCS) based on the use of GIS technologies are considered.

GEOGRAPHIC INFORMATION LAND CADASTRAL SYSTEMS

Industry knowledge training direction, specialty, education level	
Educational qualification	*Bachelor*
Specialty	*193 Geodesy and Land management*
Educational program	*Geodesy and Land management*
Description of the course	
Type	Sample
Total number of hours	*120*
Number of credits ECTS	*4*
Number of content modules	*2*
Course project (work)	-
Form of Control	Final test
Descriptions of the course for full-time and distance learning	
	Full-time
Year of training	*3*
Semester	*2*
Lectures	*15*
Practical, seminars	-
Laboratory studies	*30*
Independent work	*75*
Individual tasks	-
Number of weekly hours for full-time study: classroom	*3*

1. Task and purpose of the discipline

Aim

The purpose of the course is to master and acquire the necessary theoretical knowledge and practical skills in the field of geoinformation support of the state land cadastre and knowledge formation on the development of geoinformation land cadastral national systems of Ukraine and the world, the contribution of Ukrainian and foreign scientists.

Task

The task of studying the discipline is to form a specialist's theoretical knowledge and practical skills of geoinformation support of land cadastral works for planning the development of territories, inventory of land resources, forecasting the state of the land fund, control over the use and protection of soils.

The discipline provides the formation of a number of competencies:

general competencies:

- ZK01. Ability to learn and master modern knowledge;
- ZK02. Ability to apply knowledge in practical situations;
- ZK05. Ability to communicate in a foreign language;
- ZK07. Ability to work autonomously;
- ZK08. Ability to work in a team;
- ZK12. The ability to exercise one's rights and responsibilities as a member of society; awareness of the value of a civil (free democratic) society and the need for its sustainable development, the rule of law, the rights and freedoms of a person and a citizen in Ukraine;
- ZK13. The ability to preserve and multiply moral, cultural, scientific values and achievements of society based on an understanding of history, the patterns of development of the subject area, its place in the general system of knowledge about nature and society, as well as in the development of society, technology and technologies, to use various types and forms of motor activities for recreation and leading a healthy lifestyle.

special competencies:

- SK02. Ability to apply theories, principles, methods of physical and mathematical, natural, socio-economic, engineering sciences when performing tasks of geodesy and land management;
- SK03. Ability to apply regulatory and legal acts, regulatory and technical documents, reference materials in professional activity;
- SK04. Ability to choose and use effective methods, technologies and equipment for carrying out professional activities in the field of geodesy and land management; SK05. The ability to use modern information, technical and technological support to solve complex issues of geodesy and land management;
- SK06. The ability to perform remote, ground, field and camera research, engineering calculations for the processing of research results, form research results, prepare reports when solving geodesy and land management tasks;
- SK07. The ability to collect, update, process, critically evaluate, interpret, store, publish and use geospatial data and metadata regarding objects of natural and man-made origin;
- SK08. The ability to carry out professional activities in the field of geodesy and land management, taking into account the requirements of professional and civil safety, labor protection, social, ecological, ethical, economic aspects.

Program learning outcomes:

- RN2. Organize and manage the professional development of individuals and groups;
- RN3. Convey information, ideas, problems, solutions, own experience and arguments to specialists and non-specialists;

- RN4. Know and apply in professional activity regulatory and legal acts, regulatory and technical documents, reference materials in the field of geodesy and land management and related fields;
- RN5. Apply conceptual knowledge of natural and socio-economic sciences when performing tasks of geodesy and land management;
- RN9. Collect, evaluate, interpret and use geospatial data, metadata about objects of natural and man-made origin, apply statistical methods of their analysis to solve specialized problems in the field of geodesy and land management.

2. Program and structure of the discipline

full-time study form:

Titles content modules and themes	Hours												
	Full-time form							By correspondence					
	weeks	total	including					total	including				
			l	p	lab	ind	i.w.		l	p	lab	ind	i.w.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Content module I. Basic concepts of geoinformation support of land cadastre.													
Topic 1: The concept of geoinformation support of land cadastre.	1-2	12	2		2		8						
Topic 2. Regulatory documents and standardisation of the process of geoinformation support of land cadastre.	3-4	10	1		2		7						
Topic 3: Hardware and software for the implementation of the geoinformation land cadastre system.	5-6	12	1		3		8						
Topic 4. Geoinformation modelling. Land cadastral geospatial databases. Data banks.	7-8	14	2		4		8						
Topic 5. Concept and functions of land information systems.	9-10	12	2		3		7						
Together for the semantic module 1		60	8		14		38						
Content module II. The concept of creating geographic information land cadastral systems.													
Topic 6: Information base of geographic information systems. The concept of creating geoinformation land cadastre systems.	11-12	19	2		5		12						
Topic 7. Fundamentals	13	19	2		5		12						

of geospatial analysis and cartographic modelling in geoinformation land cadastre systems.	- 14												
Topic 8: Fundamentals of creating land cadastral information. Index cadastral map (plan).	15	22	3		6		13						
Together for the semantic module 2		60	7		16		37						
		120	**15**		**30**		**75**						

3. Topic of laboratory classes

№ c/o	Name of topic	Number of hours
1	**Topic 1: Creation of vector layers of an indo-cadastral map (plan).** Downloading land cadastral data (shapefiles) in the ArcGIS environment and creating new polygon layers: the boundaries of the area, the boundaries of village councils, boundaries of settlements, cadastral zones and cadastral districts.	2
2	**Topic 2: Vectorization of land cadastre data.** Vectorization of cadastral zones, quarters within the territory of the district.	6
3	**Topic 3. Creation of database structure and introduction of land cadastral attributive information.** Functions of selection of land cadastral geodata by attributes. Finding and changing cadastral geodata records in data gobag. Adding new columns to the registry. Create additional fields in the table of attributes of land cadastral geodata.	6
4	**Topic 4. Creating the layout of graphic materials**. Counts for layout: map projections, shape of the depicted territory, orientation of the image, heterogeneity of the image of neighboring territories, map legend, presence or absence of additional elements, assignment of the map.	4
5	**Topic 5. Layout of graphic materials. Creation of the index-cadastral map of the district and a separate administrative-territorial unit.** Queries like a form of information search. Search, extract, replace, enter geodata using queries. Processing of the entered land cadastral geodata. Placing a cartographic image, the name of the map of the symbols, the line and other auxiliary equipment of the card within the sheet.	3

6	**Topic 6. Filling the geodatabase with attribute land cadastral geodata. Land cadastral geodata and their characteristics.** Convert CAD geodata format (.DWG (AvtoCAD)) into a shaped file (ArcGIS). Attach an attribute table to a shape file. Layout of graphic materials. Creation of a cadastral quarter plan and land plot layout.	5
7	**Topic 7. Introduction of the land cadastre geodata to the existing database** Add CAD files (.DWG (AvtoCAD)) to the project. Create objects by existing coordinates. Creation of objects by points which are added from the external tables of the results of geodetic surveys. Introduction of new data in the database of land plots.	4
Total		**30**

4. Topics of independent work

№	Topic name	Number of hours
1	The main characteristic of the modern multi-purpose cadastre	13
2	Registration and cadastral survey as basic components modern land cadastre	12
3	Components that are subject to registration (rights, deeds and property objects) in the NCS	13
4	Components of spatial data infrastructure	12
5	Historical origins and features of the modern stage of land cadastre creation in Ukraine	12
6	Tasks and features of the formation of the urban cadastre	13

5. Means of diagnosing learning outcomes:

- exam;
- module tests;
- essays;
- protection of laboratory work.

6. Teaching methods:

- verbal method (lecture, discussion, interview, etc.);
- practical method (laboratory, practical classes);
- visual method (illustration method, demonstration method);
- work with educational and methodical literature (summarizing, summarizing, annotating, reviewing, writing an abstract);
- video method (remote, multimedia, web-oriented, etc.);
- independent work (task performance).

7. Evaluation methods.

- exam;
- oral or written survey;
- modular testing;
- abstracts, essays;
- defence of laboratory works;
- presentations and speeches at scientific events.

8. **Distribution of points received** by students of higher education. The assessment of the knowledge of a higher education student takes place on a 100-point scale and is translated into national assessments according to the table. 1 of the current "Regulations on examinations and assessments at NUBiP of Ukraine"

8.1 Distribution of points by type of learning activity

Theme	Learning outcomes	Evaluation
8 term		
MODULE 1. BASIC CONCEPTS OF GEOINFORMATION SUPPORT OF LAND CADASTRE		
Topic 1. The concept of geoinformation support of land cadastre.		
Lab 1: Creating vector layers of an index cadastral map (plan).	RN 5.9 Including understand the theoretical foundations of the modern process of geoinformation support of land cadastre and its role in the system of land relations. Know the tasks, basic concepts and definitions, requirements for geographic information land cadastre systems. Know the content and structure of the course Geoinformation land cadastre systems.	15
Independent work 1: Main characteristics of a modern multi-purpose cadastre		5
Topic 2. Regulatory documents and standardisation of the process of geoinformation support of land cadastre.		
Lab 2: Vectorisation of cadastral zones, quarters and KOATSU levels	RN 3, 4,5 Including understand the structure and standards governing the operation of geographic information land cadastre systems. Know the main regulatory documents governing the creation and operation of geographic information land cadastre systems. Know the international ISO standards for the creation of geographic information land cadastre systems.	5
Independent work 2: Registration and cadastral surveying as basic components of a modern land cadastre		5
Topic 3: Hardware and software for the implementation of the geoinformation land cadastre system.		
Lab 3: Creating a database structure and entering land cadastral attribute information	RN 2,3 Including know the hardware, basic equipment and software available on the market for the creation and development of geographic information land cadastre systems. Know the classification of land use restrictions.	10
Topic 4. Geoinformation modelling. Land cadastral geospatial databases. Data banks.		
Lab 4: Layout of graphic materials	RN 5,9 Including know the types of land cadastral databases and data banks. Distinguish between	5

Independent work 3: Components to be registered (rights, transactions and property) in the NCC	geographic information modelling in land cadastral systems.	5
Topic 5. Concept and functions of land information systems.		
Lab 5: Layout of graphic materials. Create an index-cadastral map of the district and a separate administrative-territorial unit.	RN 4,5,9 Including know geographic information land cadastre systems as components of land information systems. Understand the main functions and tasks performed by land information systems.	20
Module control		30
Total by content module 1		100
MODULE 2. CONCEPT OF CREATION OF GEOINFORMATION LAND CADASTRE SYSTEMS.		
Topic 6: Information base of geographic information systems. The concept of creating geoinformation land cadastre systems.		
Lab 6: Filling the geodatabase with attributive land cadastral data. Land cadastral data and their characteristics.	RN 3,4,5,9 Including to know the basic sources of geospatial information for the creation of the National Cadastral System (NCS). Understand the main components of the NCS information base. To know the conceptual foundations, principles, architecture of the NCS.	20
Independent work 4: Components of spatial data infrastructure		10
Topic 7. Fundamentals of geospatial analysis and cartographic modelling in geoinformation land cadastre systems.		
Lab 7: Entering land cadastral data into an existing database.	RN 2,9 Including know the main tasks of GIS analysis in geographic information land cadastre systems. Know cartographic modelling using geographic information land cadastre systems. Understand the types of cartographic support of the State Land Cadastre, its types.	15
Independent work 5: Historical origins and peculiarities of the current stage of land cadastre development in Ukraine		5
Topic 8: Fundamentals of creating land cadastral information. Index cadastral map (plan).		
Independent work 6: Tasks and peculiarities of urban planning cadastre formation	RN 2,3,4,5,9 Including know the principles of creating land cadastral information. Understand the classifier of information of an electronic terrain map. Know the basics of creating and working with digital index cadastral maps (plans).	20
Module control		30
Total by content module 2		100
Educational work	(M1 + M2)/2*0,7 ≤ 70	70

Examination		30
Total for the course		100

8.2.Scale for assessing the knowledge of a higher education student

Student rating, points	National grade based on exam results
90-100	**Excellent**
74-89	**Good**
60-73	**Satisfactory**
0-59	**Unsatisfactory**

In order to determine the rating of a student (listener) in the discipline $\mathbf{R_{dis}}$ (up to 100 points), the rating from the exam $\mathbf{R_{ex}}$(up to 30 points) is added to the rating of a student's academic work $\mathbf{R_{aw}}$ (up to 70 points): $\mathbf{R_{dis} = R_{aw} + R_{ex}}$ **.**

8.3. Assessment policy

Policy on deadlines and retakes	works that are submitted late without valid reasons will be assessed with a lower grade. Modules may be retaken with the permission of the lecturer if there are valid reasons (e.g. sick leave).
Policy on academic integrity	cheating during tests and exams is prohibited (including using mobile devices). Term papers and essays must have correct textual references to the literature used
Attendance policy	attendance is compulsory. For objective reasons (e.g. illness, international internship), training can take place individually (online in agreement with the dean of the faculty)

9. Educational and methodological support

- electronic educational course of the educational discipline (on the educational portal of NUBiP of Ukraine eLearn - https://elearn.nubip.edu.ua/course/view.php?id=1715) (date of the last course certification 2023);
- abstracts of lectures and their presentations (in electronic form - https://elearn.nubip.edu.ua/course/view.php?id=1715);
- textbooks, training aids, workshops;
- methodical materials on the study of the academic discipline for students of higher education full-time and part-time forms of higher education

1. Pržulj, Đ.; Dejanović, I.; Stefanović, M.; Lolić, T.; Sladojević, S. Domain-Specific Language for Land Administration System Transactions. ISPRS Int. J. Geoinf. 2022

Kalogianni, E.; Janečka, K.; Kalantari, M.; Dimopoulou, E.; Bydłosz, J.; Radulović, A.; Vučić, N.; Sladić, D.; Govedarica, M.; Lemmen, C.; et al. Methodology for the Development of LADM Country Profiles. Land Use Policy 2021

10. Recommended sources of information

Basic

1. Land Code of Ukraine: Law of Ukraine dated October 25, 2001 No. 2768-III. URL: http://zakon3.rada.gov.ua/laws/show/2768-14. (date of application: 26.03.2021).
2. On the State Land Cadastre: Law of Ukraine dated 07.07.2011 No. 3613-VI. URL: http://zakon3.rada.gov.ua/laws/show/3613-17, free. – (date of application: 24.04.2021)
3. Hustad, E.; Olsen, D.H. Creating a Sustainable Digital Infrastructure: The Role of Service-Oriented Architecture. Procedia Comput. Sci. 2021, 181, 597–604.
4. Fetai, B.; Tekavec, J.; Fras, M.K.; Lisec, A. Inconsistencies in Cadastral Boundary Data—Digitisation and Maintenance. Land 2022, 11, 2318.

5. Popov, A. (2019). Land cadastre development in Ukraine: issues to be addressed. Geodesy and Cartography, 45(3), 126-136. https://doi.org/10.3846/gac.2019.7121
6. Kalogianni, E.; van Oosterom, P.; Dimopoulou, E.; Lemmen, C. 3D Land Administration: A Review and a Future Vision in the Context of the Spatial Development Lifecycle. ISPRS Int. J. Geoinf. 2020, 9, 107.
7. Križanović J, Roić M. Development of a Methodology and Model for Land Administration Data Dissemination Processes. Land. 2023; 12(3):711. https://doi.org/10.3390/land12030711
8. FIG. Geospatial Data in the 2020s: Transformative Power and Pathways to Sustainability; FIG Publication: Copenhagen, Denmark, 2022; No. 78; ISSN 2311-8423. ISBN 978-87-93914-01-8.
9. Polat, Z.A.; Alkan, M.; Paulsson, J.; Paasch, J.M.; Kalogianni, E. Global Scientific Production on LADM-Based Research: A Bibliometric Analysis from 2012 to 2020. Land Use Policy 2022, 112, 105847.
10. INSPIRE Data Specification on Cadastral Parcels (2014) Technical Guidelines 3.1. URL: http://inspire.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_CP_v3.1.pdf
11. Van Oosterom, P.; Unger, E.-M.; Lemmen, C. The Second Themed Article Collection on the Land Administration Domain Model (LADM). Land Use Policy 2022, 120, 106287.
12. ISO 19152 (2012) Geographic information - Land Administration Domain Model (LADM), ISO TC 211/SC, International Organization for Standardization, http://www.iso.org/iso/catalogue_detail.htm%3Fcsnumber%3D51206.

Additional

1. Mondal S, Bandyopadhyay J, Chakravarty D (2015) Land Information System using cadastral techniques, Mining Area of Raniganj, Barddhaman district, India. Int J Remote Sens Appl (IJRSA) 5:45–53
2. Mondal, S., Chakravarty, D., Bandyopadhyay, J. et al. GIS based Land Information System using Cadastral model: A case study of Tirat and Chalbalpur rural region of Raniganj in Barddhaman district. Model. Earth Syst. Environ. 2, 120 (2016).
3. Law of Ukraine "On the National Infrastructure of Geospatial Data" dated May 19, 2020. 2020, No. 38, p. 7, article 1237, act code 99063/2020.
4. Cadastral surveys and records of land rights. URL: http://www.fao.org/3/v4860e/v4860e03.htm
5. Legislation of Ukraine [Electronic resource]. URL: http: http://rada.gov.ua